

CLAIMS

1. A manufacturing method of a magnetic recording medium comprising:

5 a resist layer processing step of processing a resist layer of an object to be processed in a predetermined pattern, in the object a continuous recording layer, a mask layer, and the resist layer being formed on a surface of a substrate in that order;

10 a mask layer processing step of processing the mask layer in the pattern based on the resist layer;

 a resist layer removal step of removing the resist layer on the mask layer; and

 a continuous recording layer processing step of
15 processing the continuous recording layer in the pattern by dry etching based on the mask layer to divide the continuous recording layer into a number of divided recording elements, wherein

 the resist layer removal step is performed before the
20 continuous recording layer processing step.

2. The manufacturing method of a magnetic recording medium according to claim 1, wherein:

 the mask layer includes a layer having a lower etching rate in the continuous recording layer processing step than
25 that of the continuous recording layer; and

the layer is formed to be thinner than the continuous recording layer.

3. The manufacturing method of a magnetic recording medium according to claim 2, wherein

5 the layer of the mask layer, which has the lower etching rate in the continuous recording layer processing step than that of the continuous recording layer, has a thickness t that satisfies $3 \leq t \leq 15$ nm.

10 4. The manufacturing method of a magnetic recording medium according to claim 2, wherein

the layer of the mask layer, which has the lower etching rate in the continuous recording layer processing step than that of the continuous recording layer, has a thickness t that satisfies $3 \leq t \leq 10$ nm.

15 5. The manufacturing method of a magnetic recording medium according to any one of claims 2 to 4, wherein

20 the layer of the mask layer, which has the lower etching rate in the continuous recording layer processing step than that of the continuous recording layer, is made of diamond like carbon.

6. The manufacturing method of a magnetic recording medium according to any one of claims 1 to 5, wherein

the continuous recording layer processing step processes the continuous recording layer by ion beam etching.

25 7. The manufacturing method of a magnetic recording

medium according to any one of claims 1 to 6, wherein:

the mask layer includes a first mask layer and a second mask layer arranged between the first mask layer and the resist layer, the first mask layer having a lower etching rate in the continuous recording layer processing step than that of the continuous recording layer, the second mask layer having a lower etching rate in the resist layer removal step than that of the first mask layer; and

the mask layer processing step includes: a second mask layer processing step of processing the second mask layer in the pattern based on the resist layer; and a first mask layer processing step of processing the first mask layer in the pattern based on the second mask layer.

8. The manufacturing method of a magnetic recording medium according to claim 7, wherein

the resist layer removal step also serves as the first mask layer processing step.

9. The manufacturing method of a magnetic recording medium according to claim 8, wherein

the resist layer removal step removes the resist layer and processes the mask layer by employing reactive ion etching which uses one of oxygen and ozone as a reactive gas.

10. The manufacturing method of a magnetic recording medium according to claim 8 or 9, wherein

the second mask layer is formed to be sufficiently thin

and/or is formed of a material having a higher etching rate in the continuous recording layer processing step than that of the continuous recording layer, for enabling the second mask layer on the first mask layer to be removed in the continuous recording layer processing step.

11. The manufacturing method of a magnetic recording medium according to any one of claims 8 to 10, wherein the second mask layer is formed of a silicon-based material that comprises at least one of silicon or a silicon compound.

12. The manufacturing method of a magnetic recording medium according to any one of claims 8 to 11, wherein the second mask layer processing step processes the second mask layer by employing reactive ion etching which uses a fluorinated gas as a reactive gas.

13. The manufacturing method of a magnetic recording medium according to any one of claims 1 to 12, wherein the resist layer processing step processes the resist layer by imprinting.

14. The manufacturing method of a magnetic recording medium according to any one of claims 1 to 13, wherein a plurality of objects to be processed are simultaneously processed.

15. A manufacturing method of a magnetic recording medium, comprising:

a resist layer processing step of processing a resist layer of an object to be processed in a predetermined pattern, in the object a continuous recording layer, a mask layer, and the resist layer being formed on a surface of a substrate in that order;

a mask layer processing step of processing the mask layer in the pattern based on the resist layer;

a resist layer removal step for removing the resist layer on the mask layer; and

a continuous recording layer processing step of processing the continuous recording layer in the pattern by ion beam etching based on the mask layer to divide the continuous recording layer into a number of divided recording elements, wherein

the resist layer removal step is performed before the continuous recording layer processing step.

16. A manufacturing apparatus of a magnetic recording medium, comprising: a processing device for performing the manufacturing method of a magnetic recording medium according to any one of claims 1 to 15; and a holder for simultaneously holding a plurality of objects to be processed, wherein

the manufacturing device is configured to process the plurality of objects to be processed simultaneously.

17. The manufacturing apparatus of a magnetic recording medium according to claim 16, wherein

an ion beam etching device for processing the continuous recording layer is provided.